

# Use Of Remote Control Vehicles In Explosive Ordnance Disposal Operations

by *Captain Kevin Ivison GM*

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**E**xplosive Ordnance Disposal (EOD) and, in particular, Improvised Explosive Device Disposal (IEDD) operations have never been in so much demand, in so many theatres and of such complexity as in today's operational environment. Operations Telic (Iraq), Herrick (Afghanistan) and Banner (Northern Ireland) have demanded a continual evolution in IEDD training, equipment and Tactics, Techniques and Procedures (TTPs). This paper will highlight in particular the role of the Remote Control Vehicle (RCV) in IEDD operations, the challenges facing the procurement and employment of such equipment and the likely requirement for this technology in the medium and long terms.

## Aim of IEDD RCVs

The aim of IEDD RCVs is to reduce the risk to life by increasing the stand-off distance at which IEDs can be rendered safe in order to preserve life, gain technical intelligence for exploitation and gather forensic evidence to prosecute perpetrators.

## History

In the period 1971–72, 321 EOD Unit, Royal Army Ordnance Corps (RAOC) lost eight

IEDD operators on active duty in Northern Ireland. This rate of attrition was largely due to the ability to neutralise devices only after a 'Manual Approach'<sup>1</sup> had been made, and the limited options available to that operator once at the target. All devices had to be neutralised manually or by placing a 'Pigstick'<sup>2</sup> disrupter in close proximity to the target. The ability to neutralise devices from distance was highlighted as a key capability which would assist in the protection of IEDD operators and members of the public alike.

The then Military Vehicles and Engineering Establishment (MVEE) was tasked with the delivery of a remote means of attaching towing ropes to cars in order that they may be moved without exposing operators to the possibility of initiating a Victim Operated (VO) device. Development was quick and the first RCV (named Wheelbarrow) was delivered to Northern Ireland on 30 March 1972. 321 EOD Unit RAOC (now 321 EOD Squadron Royal Logistic Corps) never again experienced losses on such a scale as in 1971–72.

## Outline of Capability

Although there have been numerous iterations of Wheelbarrow, and other countries have developed their own RCVs, the key capabilities provided by RCVs have remained constant over the last 20 years. The three key capability areas are:

- Reconnaissance.
- Manipulation.
- Disruption.

I will not focus too greatly on the actual disruption mechanism in this paper, as this is often not unique to a particular RCV.

## Current systems

The British Armed Forces currently employ two types of IEDD RCV to cater



*Modified Wheelbarrow in action, Al Amarah, 2006 [Joint EOD Group]*

for differing operational scenarios. The option of using a Mini RCV on Light Scale<sup>3</sup> deployments as opposed to a Main RCV (used on Heavy Team<sup>4</sup> deployments) allows a great deal of flexibility and allows IEDD Teams to more closely follow the Commander's intent.

The current Mini RCV capability (Buckeye) was designed to conduct IEDD operations in confined spaces such as aeroplanes, trains, buses and any other area which precludes the use of the much larger Wheelbarrow Mk8b. Whilst the Mini RCV does not have the same manipulative power, mobility, disruptive capabilities or observation abilities as the Main RCV, it can perform many tasks that are unsuited to the Main RCV.

For use on overseas operations, Buckeye has been overhauled and reincarnated as Chevette. This process added a manipulation arm, replaced the tracks with wheels and improved the power supply, cameras and robustness of the vehicle. This upgrade has enabled the RCV to be used extensively on Operations Telic and Herrick where Light Scale deployments by helicopter and AFV are increasingly prevalent.

The Wheelbarrow Mk8b provides the current Main RCV capability for UK MoD. It, like its predecessors, was designed for use in Northern Ireland and Great Britain and has been essential in the IEDD battle.

Along with the improvements to Buckeye, the Wheelbarrow Mk8b has evolved to ensure its effectiveness in some extremely demanding conditions. It has, to some extent, been made more resistant to hot climates, had improvements made to its camera systems and has seen significant enhancement to its disruptive capability. In particular, it now possesses a significant stand-off capability which has been used time and again on live operations.

### Medium Term Requirement

In the near to medium term, UK MoD has continued to adopt a two-systems approach to the IEDD RCV capability. The replacement for Wheelbarrow Mk8b is Cutlass. When judged side by side in the three key capability areas, RCV Cutlass proves to be a step change in IEDD RCV Capability:

- **Observation.** Increased situational awareness is available through a larger number of cameras, and more intelligent placement of those cameras on the RCV. The Wheelbarrow Mk8b had adequate observational capabilities with its three cameras, but was limited by the operator's inability to see the whole of the RCV easily.
- **Manipulation.** Possibly the biggest improvement in capability has been in the area of manipulation. The Cutlass manipulator arm is not only far more dextrous than its predecessor, but is far more intuitive, easier to control (and train on) and places less burden on the operator for any given task. The ability to record a series of movements (for instance those taken in positioning an EOD weapon under a vehicle) and then have the RCV automatically return to its original position is one good example. It is exactly this kind of functionality which reduces the IEDD operator's workload and information burden, and allows him to get on with the task at hand.
- **Disruption.** Whilst this paper will not deal with the disruptors (and their effects) themselves, it is appropriate to mention the particular systems ability to enable that disruption. The Cutlass



Two Packbots on trial at the Army School of Ammunition [Army School of Ammunition]

situational awareness, Human Machine Interface (HMI) and stand-off capability are a generation ahead of what Wheelbarrow Mk8b can offer.

*'The Packbot is significantly more mobile and provides better situational awareness and increased safety features, but the key area of improvement is in the HMI'*

Buckeye is to be replaced by Packbot. The Packbot is significantly more mobile and provides better situational awareness and increased safety features, but the key area of improvement is in the HMI. This system is far easier to train on and operate, and as such has won the confidence of the British IEDD community – a key battle in

procurement! This equipment has been so successful in trials that many operators are discussing whether to employ the Mini RCV on some 'normal' tasks in place of the Wheelbarrow Mk8b.

### Long-Term Requirement

The long-term aim of IEDD RCVs is to place as much human capability as close to the IED as possible, whilst keeping the human beings as far away as possible from the device. In the long term, the following capabilities must be increased in order to maximise the utility of IEDD teams on operations.

### Size and Weight

The tempo of current operations and high risk of conventional attack en route to the target may dictate that the IEDD team travels by air, or armoured fighting vehicle (AFV). As such, the requirement for helicopter-deployable Light Scale operations has cemented the requirement for an RCV which can be carried easily by a one- or two-man team, can be easily maintained in the field and still provide as much IEDD functionality as is expected

on Military Assistance to the Civil Power (MACP) operations.

### Bandwidth

Future RCV systems will send images, live video, GPS Data, sensor information and RCV operating commands. Bandwidth allocation is unlikely to increase, so more intelligent use must be made of frequencies already allocated. Future systems may also be required to communicate all this data to other RCVs, Bronze, Silver and Gold Commands (roughly strategic, operational and tactical levels of command) as well as the EOD LSV.

### HMI

With an increase in RCV functionality comes an increase in complexity of C2 systems. We must be careful that IEDD operators (and other members of their team) are not overloaded with information or forced to execute unnecessarily complex commands whilst under extreme pressure. Where possible, actions should be automated and much of the input of detail taken away from the IEDD team and turned into single-button commands. Cutlass already has the option of a single-button press to configure, for example, defeat of Under Vehicle IED (UVIEDs) and can automatically select and load a different weapon when instructed to. It should also be possible to operate both Mini and Main RCV from a single HMI.

### Reliability and Robustness

The days of RCVs being designed with only operations in the UK in mind are long gone. Future systems must be able to operate in extremes of temperature, at altitude, in desert conditions, in harsh radio frequency (RF) environments and without second-line maintenance being freely available. A modular approach should be taken so that an IEDD team can self-help with the majority of maintenance tasks. Battery life must also be increased for Light Scale deployments without the LSV. As a minimum, RCV batteries must be able to be charged from readily available sources, not only those fitted to the LSV. The American-made Talon robot provides good lessons in reliability and maintenance – it is completely modular and requires little maintenance training.



*Packbot human-machine interface – a key area of improvement [Army School of Ammunition]*

### CBRNE Sensors

The IEDD RCV is an ideal platform on which to mount Chemical, Biological, Radiological, Nuclear and Explosive (CBRNE) sensors. Such sensors could be mounted as a matter of course on all RCVs and will become much more of a requirement in the build-up to 2012 and in line with the continuing threat from terrorists who may aim to use chemical, biological or radiological devices.

### Systems Approach

All of the above capabilities would enhance overall capability. However, they could not be maximised unless the data being gathered was easily transmissible to necessary parties. The link between RCV, LSV, Ops room, Bronze, Silver and Gold Commands must be seamless.

### Summary

The UK already possesses excellent IEDD RCV capability and the introduction of Cutlass and Packbot will ensure we remain world leaders in the medium term. We must continue to provide an ability to

deploy in all operational scenarios, from a range of vehicles in all climatic conditions. We must also look to add new capability areas – the addition of CBRNE sensors would be a step change in capability. Above all else, we must ensure that the RCV serves to add capability, without overloading the IEDD operator with information, and remains focused on its most important role – to save life.

### NOTES

- <sup>1</sup> The process of moving from the Incident Control Point to the target
- <sup>2</sup> Introduced in 1971–72, the Pigstick fired water at high pressure in order to disrupt a target before it could function. Modified versions of Pigstick are still in use today
- <sup>3</sup> Defined as IEDD operations without a Main RCV and Logistic Support Vehicle (LSV)
- <sup>4</sup> Defined as IEDD operations utilising a Main RCV and LSV